

Technical Note 36

**COST-EFFECTIVENESS ANALYSIS
OF SAFE MOTHERHOOD SERVICES
IN SOUTH KALIMANTAN, INDONESIA**

**OPTIONS AND RECOMMENDATIONS FOR RESEARCH
DESIGN AND COST ESTIMATING**

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ABSTRACT

This technical note, prepared at the request of USAID's MotherCare project, is intended to provide assistance in developing a research design and methodology for assessing the cost-effectiveness of maternal health program improvements that the Ministry of Health (MOH) in Indonesia is planning with MotherCare's assistance in three districts of South Kalimantan, Indonesia. The note provides options and recommendations to help 1) develop a framework for identifying the costs of safe motherhood services at the different levels of the district health system in South Kalimantan, as well as costs for pregnant women and their families; and 2) develop selected aspects of a research design for the cost-effectiveness analysis to help integrate data collection for the cost and the effectiveness measures of safe motherhood interventions in South Kalimantan province.

This technical note also incorporates suggestions that would permit analysis of a second and equally important issue in the Indonesian context -- the financial sustainability of MOH plans to ensure that recently trained community-based midwives make a transition from MOH salary support to self-financing service delivery at the village level.

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1.0 INTRODUCTION

USAID's MotherCare project asked the Health Financing and Sustainability (HFS) project to provide assistance in developing a research design and methodology for assessing the cost-effectiveness of maternal health program improvements that the Ministry of Health (MOH) in Indonesia is planning with MotherCare's assistance in three districts of South Kalimantan, Indonesia. The South Kalimantan program is one among multiple safe motherhood programs being implemented in Indonesia within the framework of the Indonesian National Safe Motherhood Strategy.

The long-term goals of the South Kalimantan safe motherhood program are "to reduce maternal and newborn deaths and to improve the health of the women and newborns in South Kalimantan." (Koblinsky, 1995) Other safe motherhood programs in Indonesia share the same goals of reducing maternal and perinatal mortality in the country. Specific objectives of the South Kalimantan MotherCare program include: 1) improved use of appropriate services for women and newborns with complications, 2) reduction of the level of anemia among pregnant women, and 3) reduction of the level of infections in pregnant women related to maternal and perinatal health outcomes (Koblinski, 1995).

The Indonesian MOH and MotherCare are planning to investigate jointly the cost-effectiveness of the safe motherhood strategies they undertake in South Kalimantan. Although the planned strategies are only preliminary at the time of preparing this technical note, they can be used as the base to develop a feasible methodology, with the understanding that details would necessarily change pending adoption of the project's final strategy(ies). Since the MOH and MotherCare will be identifying effectiveness indicators based on the objectives they have chosen for the program, they asked that HFS concentrate especially on an approach for identifying and estimating the costs of the planned improvements.

The specific objectives of this technical note are to assist the Indonesian MOH and MotherCare project in:

- a. developing a framework to identify the costs of safe motherhood services at the different levels of the district health system in South Kalimantan, as well as for pregnant women and their families;
- b. developing selected aspects of a research design for the cost-effectiveness analysis to help integrate data collection for the cost and the effectiveness measures of safe motherhood interventions in the South Kalimantan province.

This technical note also incorporates suggestions that would permit analysis of a second and equally important issue in the Indonesian context — the financial sustainability of MOH plans to ensure that recently trained community-based midwives make a transition from MOH salary support to self-financing service delivery at the village level.

2.0 MATERNAL HEALTH SERVICES IN SOUTH KALIMANTAN, INDONESIA

To establish the overall framework for analyzing both the costs and effects of the planned intervention, this section presents first an overview of existing maternal health services in the project districts of South Kalimantan, and second, possible safe motherhood interventions at the different levels of the existing district health system. The principal elements of the existing system and the interventions are especially important since estimating the costs of different expenditure items for several levels of the district health system will be the main challenge in analyzing the costs of safe motherhood interventions in South Kalimantan. Most of the information on the current situation is adapted from Achadi et al. (1994) and Koblinsky and Marshall (1995).

2.1 Overview of Existing Maternal Health Services

In 1994, the population of South Kalimantan was estimated at 2,784,000 inhabitants. The target population of pregnant women was estimated to be about 75,000 women per year. In the three districts of Banjar, Hulu Sungai Selatan (HSS), and Barito Kuala, the population was estimated to be 492,000, 187,000, and 227,000 inhabitants, respectively. Among these districts, the estimated number of pregnant women was estimated at 14,000, 5,600, and 6,600, respectively.

The level of literacy is relatively high in South Kalimantan. The literacy rate among women aged ten and above is estimated at 91 percent in the urban areas and 77 percent in the rural areas. The marriage age is still quite young, however, with an estimated 60 percent of women entering into their first marriage before the age of 19. However, the contraceptive prevalence of women in South Kalimantan is quite high (47 percent), which undoubtedly contributes to the relatively low total fertility rate, which was estimated at 3.2 in 1990.

The relatively high level of contraceptive practice and the low level of fertility have likely improved reproductive health in South Kalimantan. Maternal and perinatal health services, however, are still weak in the province and are dominated by traditional practices. Efforts are currently underway to improve traditional maternal health practices and to bring modern maternal health services to the village level.

2.1.1 Traditional Family and Community Services

The first person to face the costs of the management of a pregnancy is, of course, the pregnant woman. She first turns to her family to share these costs within the home. In an extended family system, the sharing of these costs may be spread so widely that they can be hard to identify. This support in the management of pregnancy can be affected by the services of a mother-in-law, a sister, or a friend, which can involve, for example, family members giving advice to the woman on which maternal health service provider to use, or assisting a traditional birth attendant during delivery. This type of support is highly prevalent in South Kalimantan where about 80 percent of deliveries occur in the home. Its methodological relevance is two-fold. First, from the societal point of view, it is critical to ask what it costs the family and the government to sustain this support. Second, from the government and health system's point of view, it is important to know what it costs to provide the pregnant woman, her family and the community the critical knowledge and information for the safe management of pregnancy.

Beyond the family's support in the management of pregnancy, the most readily available maternal health services are those provided by traditional birth attendants (TBAs). It is estimated that there is one TBA per 24 pregnant women in South Kalimantan. In the three districts of Banjar, HSS and Barito Kuala, the ratio of TBAs to pregnant women is one to 28, one to 25, and one to 18, respectively. TBAs provide services during pregnancy and during delivery, as well as during the postpartum period. Existing public health programs are attempting to integrate traditional birth attendants into their strategies. These efforts include training TBAs, providing them with labor and delivery supplies, and including them in subdistrict referral and health information systems. Of the 495 traditional birth attendants in the Banjar districts, 334 have been trained by the government. In HSS, 186 out of 227 TBAs have received training, and in Barito Kuala, 295 out of 373 TBAs have been trained.

Using trained TBAs to provide information and services at the community level is one of the strategies that can be used in decentralizing the formal maternal health services. Given the cost implications or integrating TBAs into the health system, it is important for the government to identify the resources that are involved in establishing and supporting trained TBAs.

In addition, pregnant women and their families pay for the maternal health services provided by TBAs. The levels of payment for TBA services and the relatively large number of TBAs indicates the existence of a traditional market for maternal health services. The existence of such a market is relevant not only to the cost-effectiveness analysis of alternative safe motherhood strategies in South Kalimantan, but also to the broader issue of the sustainability of village-based midwife initiatives in all of Indonesia.

2.1.2 Formal Maternal Health Services

In South Kalimantan, the provision of formal maternal health services, including family planning, prenatal, delivery, and postnatal services, extend from the *posyandu* (village health posts) and the village-based midwives (*bidan di desa*) to district hospitals. Although the private sector, including private clinics, doctors, and midwives, is active in the provision of maternal health services, the core of formal maternal health services are still provided by the public sector. Significant changes in the public-private mix in delivery of formal services may, however, occur as the village-based midwife program expands on a self-financing basis.

Posyandu are village health posts that conduct community health activities with support from groups of volunteers. There are as many *posyandu* as traditional birth attendants in South Kalimantan as a whole, as well as in the individual districts of Banjar, HSS, and Barito Kuala. Community-based activities to disseminate information on safe motherhood would presumably involve the *posyandu*, as well as TBAs or village midwives. Moreover, as Achadi et al. (1994) suggest, a close working relationship between the *posyandu* staff (*kaders*) and the village-midwives may be essential for the sustainability of the village-midwife (*bidan di desa*) program. Three groups currently support *posyandu* services: 1) the community, in terms of volunteers' time, 2) the government, which provides the non-personnel inputs for preventive and family planning services, and the 3) *puskemas* visiting team, which supports the volunteers.

The village-based midwife program is a recent initiative of the MOH in Indonesia, but its coverage is expected to grow rapidly. By 1994, 499 village-midwives were already working in remote villages without health facilities in South Kalimantan. It is expected that an additional 192 midwives and 156 nurses will be trained as village-midwives in 1995. In the three districts of Banjar, HSS, and Barito Kuala, there are already 95, 45, and 50 village-midwives, respectively.

The village-midwife, who provides family planning products and services, as well as maternal and neonatal care, is the MOH's instrument for decentralizing maternal and neonatal health programs to the community level. While health planners and managers view the *bidan di desa* as providers of maternal health services, the communities have accepted them as providers of not only maternal services but also general medical services, immunization and family planning (Achadi, 1994). It is planned that the *bidan di desa*, which are supported by the government for a limited period of time, will evolve over time into private providers supported by fees for their services. The prospect of the *bidan di desa* providing a comprehensive package of curative, preventive and promotional health services on a private basis is one of the key sustainability issues facing community-based maternal and neonatal services in Indonesia.

Before the *posyandu* and *bidan di desa* initiatives, the district health system did not have a permanent village base but consisted of health subcenters, mobile and standing clinics, and health centers. Six to seven

hundred health subcenters and 186 health centers (25 of which have beds) are currently operating in South Kalimantan. There are 23 health centers (two of which have beds) and 67 subcenters in Banjar districts, 18 health centers (three of which have beds) and 62 subcenters in HSS, and 16 health centers (five of which have beds) and 60 subcenters in Barito Kuala. Maternal health services provided in health subcenters and health centers include family planning services, antenatal services, delivery services, and postnatal services. These government facilities provide immediate support to community-based maternal health activities conducted by trained TBAs, village-midwives, and village health posts.

At the highest level of the formal district health delivery system is the district hospital. There are 18 government hospitals with 1,509 beds in South Kalimantan. There are three government hospitals and one private hospital in Banjar district, and two government hospitals each in HSS and Barito Kuala. In addition to the same maternal health services provided by the health centers, these district hospital provide emergency care, caesarian sections, and the management of referred cases.

Exhibit 2-1. Maternal Health Resources in three districts in South Kalimantan			
	District		
	Banjar	HSS	Barito Kuala
Population	492,325	186,677	227,000
Number of Pregnant Women (estimates)	14,000	5,600	6,600
<u>Health personnel</u>			
Medical doctors	49	27	16
Ob-Gynecologist	2	0	0
Pediatrician	2	0	0
Midwives	119	57	52
Community midwife	96	45	50
Traditional birth attendants	495	227	373
Trained TBA	334	186	295
Trained TBA+kits	133	127	187
Health infrastructure			
Government hospital	3	2	2
Private hospital	1	0	0
Puskesmas(Health centers)	23	18	16
Health sub centers	67	62	60
Mobile Puskesmas	32	20	14
Puskesmas with beds	2	3	5
Posyandu(Village health posts)	495	230	304

Source: Achadi et al., 1994.

These different levels of maternal health service providers are linked by supervisory systems which begin at the provincial hospitals and extend to the *posyandu* and village-midwives, and by developing referral systems which extend from the health centers to provincial hospitals. The district referral systems extend into the communities through community-based radio communications, emergency transportation schemes, and mobile referral systems based at health centers.

Three programs relevant to maternal health services are currently operating in the three districts at varying levels of activity. These are a malaria control program; an STD program which is not very active; and a nutrition program. The nutrition program is well integrated into the prenatal care services at all levels of the district health system. More importantly, the local government is committed to expanding maternal and child health services by extending the village-midwives program, by improving midwife kits, and by equipping health centers with beds.

The government provides most of the financial support for health centers, subcenters, and district hospitals, with a small share of operating costs covered through user fees. The sources of funding range from central government grants to the routine district budget. Although important resources are available in the existing formal maternal health system, these resources are currently under-utilized.

About 32 percent of pregnant women do not seek any prenatal care. In the public sector, health centers are the main source of prenatal care, serving 37 percent of all pregnant women. The next most utilized source of prenatal care is the village health posts, which serve only nine percent of pregnant women, followed by government hospitals, which are the source for six percent of pregnant women. Fourteen percent of pregnant women chose the private sector for prenatal care, primarily private midwives, who alone serve 11 percent of pregnant women. About 29 percent of deliveries are assisted by trained health providers, and 24 percent are assisted by trained TBAs. Most deliveries, however, occur at home. Among the factors which explain the low level of utilization of formal maternal health services are: the inaccessibility of formal providers to many communities, strong competition from traditional providers, and the low quality of services and information. (There are, for example, no local health education (IEC) programs to promote safe delivery and formal prenatal care.)

2.2 Safe Motherhood Interventions

Given the structure of the existing district health system in South Kalimantan, Safe Motherhood interventions may affect maternal and perinatal health through three main mechanisms that affect women's use of services and the quality of services they use.

- ▲ First, the improvement of knowledge and information about pregnancy-related health risks and technologies among women and their communities may stimulate the demand for and use of formal prenatal care, delivery care, and neonatal care services.¹
- ▲ Second, improved geographical and financial access of services, resulting from locating at the village level (decentralization) higher quality maternal health services and more effective referral systems, may lead to an increase in the utilization of formal maternal and neonatal services and in the number of referrals.
- ▲ Third, upgrading the technical capabilities and quality of maternal health services at health facilities, as well as the development of effective referral systems should lead to improvements in the management of pregnancy and pregnancy complications, and in neonatal care.

Following is a summary of the six main interventions that the MOH and MotherCare are likely to undertake to strengthen the existing health service delivery system (see Koblinski, 1995). Based on the experience of other countries, including Bangladesh (Attanayake, Fauveau and Chakraborty, 1991), significant reductions in maternal and perinatal deaths would likely result from the synergistic effects of the Safe Motherhood interventions operating simultaneously at the various levels, including the community and client level, the community-based service delivery level, and the referral and supervisory facility level.

¹Theoretically, a typical pregnant woman uses different providers to receive assistance during pregnancy, delivery, and after delivery to protect her own health and the health of her newborn. In the process of managing her pregnancy, a woman's choice of providers is limited by the financial constraints of her family and the time and monetary costs of using alternative maternal health services, as well as the information that she or her family has about her state of health, alternative maternal health technologies and their quality. Beliefs and customs that she shares with her community may lock in her pregnancy management behavior into patterns which are inconsistent with using more cost-effective alternative maternal health services. Consequently, on the demand side, Safe Motherhood interventions are likely to affect maternal and perinatal health through changes in the knowledge and information that women have about maternal health, and through financial and time constraints that the woman and her family face during the management of her pregnancy.

Use of *Bidan di Desa* (Village-Midwives). Strategies to improve the quality of maternal and perinatal care would promote linkages between hospitals, health centers and the community through the *bidan di desa*, TBAs, and pregnant women. *Bidan di desa* could be trained in the administration of a package of basic essential obstetrical skills (BEOC), record-keeping, referral procedures and postpartum/newborn care. The *bidan di desa* provide a mechanism for bringing decentralized formal maternal health services to the village level. Therefore, not only does this strategy improve the geographical and financial access of formal maternal health services, it also it could improve the efficiency of the referral system. Furthermore, the interaction of the village-midwives with the existing village health posts (*posyandu*) could increase the communities' and women's knowledge of pregnancy-related health risks.

Strengthening Information, Education and Communication (IEC). An IEC strategy directed towards families could be implemented to promote the timely utilization of services as well as self-care among women. This intervention could affect maternal and perinatal health by stimulating the demand for formal prenatal care, delivery care, and neonatal care services. IEC activities could have a significant impact on the demand for maternal care services in two ways: 1) they could lead to an increase in the proportion of pregnant women receiving prenatal care, and 2) they could cause a shift in the demand for prenatal care from traditional providers to formal providers. Similar patterns of change could also occur for delivery care and neonatal care as a result of IEC programs.

Training Midwives. Refresher training of midwives to improve the quality of maternal and perinatal health services at district hospitals, health centers and subcenters would include training in how to respond to obstetrical and newborn emergencies (life saving skills:LSS), as well as in counseling clients in such areas as recognizing the danger signs during pregnancy, caring for the newborn, anemia, and the prevention of infections. This intervention would also provide personnel at these levels with the necessary skills and capabilities to supervise the village-based providers, including the *bidan di desa* and TBAs. Finally, counseling clients would improve their knowledge of pregnancy-related risks.

Training Physicians. This intervention would seek to improve the quality of maternal and neonatal services by training doctors from first referral facilities, district hospitals, and health centers with beds in the management of obstetrical and newborn complications as well as in supervisory techniques.

Upgrading Maternal and Neonatal Care Infrastructure. Antenatal clinics, and labor and delivery rooms of first referral facilities, district hospitals and health centers with beds could be equipped with the necessary furnishings, supplies, drugs, and medical equipment. This intervention, like the two preceding ones, would aim to improve the quality of maternal health services at the first referral facilities, as well as to strengthen the management and logistical systems necessary to support these services. In combination with the two previous interventions and a functioning referral system, improvements in the infrastructure to support maternal health care would contribute to the reduction of the risk of death related to pregnancy complications.

Strengthening Administration and Referral. The Safe Motherhood interventions include three main administrative components. First, the managerial skills of the *bidan di desa* coordinator and maternal and child health (MCH) managers in each district could be strengthened. Second, efforts to strengthen and add new elements to the existing health and management information system from the *bidan di desa* to the district hospital level could be made to provide data critical for monitoring and evaluating the Safe Motherhood interventions. Finally, program meetings at the central and provincial levels could provide oversight and strategic support to the Safe Motherhood programs being implemented.

Exhibit 2. summarizes the possible interventions and three of the main outcomes that are expected to lead ultimately to health status improvements and reductions in maternal and neonatal deaths. The individual cells of the Exhibit show the health system level at which the interventions and outcomes would occur.

<i>Exhibit 2-2.</i> Safe Motherhood Interventions and Their Impact at Different Levels of the Health System in South Kalimantan			
Interventions	Outcomes of Interventions That Lead to Improved Maternal and Neonatal Health and Level of Health System at which the Outcome Occurs		
	Improved Women's and Communities' Knowledge	Improved Geographical and Financial Access to Maternal and Perinatal Health Services	Improved Technical Capacities and Maternal and Perinatal Health Services
Use of Village Midwives(<i>Bidan di desa</i>)	Community	Community	Community
Strengthen Information, Education and Communication (IEC)	Community Health Centers Subcenters		
Training of Midwives	District hospital Health Centers Subcenters	Health centers Subcenters	District hospitals Health centers Subcenters
Training of Physicians			District Hospitals Health Centers with Beds
Upgrade Maternal and Neonatal Care Infrastructure		Health Centers with Beds	District Hospitals Health Centers with Beds
Strengthen Administration and Referral		District Hospitals Health Center With Beds	District Hospitals Health Center With Beds

3.0 COST IMPLICATIONS

3.1 Cost Components

The existing and the possible project intervention activities have both investment and recurrent (annual operating) costs that will occur at all levels of the health system. The range for existing maternal health services and possible interventions in South Kalimantan includes costs for training health workers, upgrading health centers with medical equipment, purchasing a variety of medical and IEC supplies, medicines, and possibly vehicles to transport women with obstetric emergencies to health facilities. Below are the most likely categories, divided into recurrent and investment costs, that the government and communities will incur.

Expected cost components of MOH maternal and neonatal health services in South Kalimantan

Recurrent Costs

- Salaries and benefits
- Refresher Training
- Transportation (fuel, spare parts, maintenance)
- Supplies (consumable office, IEC and medical supplies)
- Pharmaceuticals, contraceptives, vaccines, other
- Indirect building, utility, administrative costs

Investment Costs

- Basic (long term) training
- Transportation (vehicles, ambulances)
- Construction/Rehabilitation of health facilities
- Equipment and durable goods (obstetric equipment)

In addition to the costs incurred by the Ministry of Health, communities that are supporting village health posts, TBAs and *bidan di desa*, as well as people using the services will incur costs.

Likely costs to consumers and communities for maternal and neonatal health services in South Kalimantan

- Contraceptives
- Medicines
- Payments in cash or in kind to TBAs and village health post (*posyandu*) workers
- Payments in cash/kind to village midwives (*bidan di desa*)
- Transportation costs to health facilities
- Fees for outpatient services at health facilities
- Fees for inpatient services, including for delivery
- Labor to construct waiting homes
- Labor to maintain or renovate health posts
- Time to travel to and wait for services

These consumer costs have become especially important as Indonesia has adopted cost recovery and fee charging policies in government facilities and expects to transfer responsibility for support of village midwives from the MOH to the communities through fees for their services. Consumer and community costs are often forgotten in cost-effectiveness analysis that concentrates on costs to government or international donors. But it is important to identify and estimate consumer and community costs along with government costs in assessments of the affordability, equity, and long run financial sustainability of the program.²

In programs in which the full cost of an item (e.g. medications) is recovered through fees charged to consumers, it is important to remember to count these

3.2 Cost Analysis

Exhibit 3-1 provides a sample framework that could be used to summarize recurrent (annual operating) and investment costs for the maternal and neonatal health services in the project districts in South Kalimantan. Program planners and managers can use data that would be entered on Exhibit 3-1. for a variety of planning, monitoring, and evaluation analyses, in addition to the cost-effectiveness analysis. Examples of such uses are listed below.

Cost-effectiveness analyses. Costs calculated from this table can be used to compare the cost-effectiveness of different interventions and improvement strategies, or of the total safe motherhood program in the project districts in South Kalimantan. Following is an example of the calculation for the total program.

Calculation of cost-effectiveness ratio for safe motherhood program.

- A. Total Safe Motherhood Costs from Exhibit 3-1.
- B. Total Effects
(e.g. women served, referrals for complicated deliveries, deaths averted, etc.)
- C. Cost per Effect
(A divided by B)

The consumer, or pregnant woman's, perspective discussed here is restrictive in that it is limited to the cost implications of the management of pregnancy. An extended perspective could cover the indirect benefits to women and their families throughout the women's life-cycle resulting from better access to maternal and perinatal services of improved quality as inputs to maternal and perinatal health production. Such a "human capital" approach to an economic analysis of improved maternal health services could build upon women's dominant role in market and nonmarket production in many settings and in the provision for family needs. This approach, however, is difficult to implement. Nonetheless, if one uses this perspective, the increased costs faced by women for the management of their pregnancies as a result of Safe Motherhood interventions are likely to be offset by the indirect benefits that also from these interventions.

Exhibit 3-1. Sample Table for Summarizing Operating (Recurrent) and Investment Costs of Maternal and Neonatal health Services

Cost Category	Consumers	Community Level	Health Center Level	Hospital Level	Administrative Level	TOTAL COSTS
1. ANNUAL OPERATING COSTS						
Personnel salaries, benefits Service delivery Trainers Managers/Administration						
Medical Supplies Contraceptives Vaccines, iron tablets, other pharmaceuticals Other						
Non-Medical Supplies Office supplies Training, IEC Other						
Transportation Fuel Maintenance Spare parts						
Building Rent Utilities Maintenance						
Other Per Diems Other						
SUBTOTAL, OPERATING COSTS						
2. INVESTMENT COSTS (annualized)						
Durable Equipment Medical and obstetric Other						
Transportation Vehicles						
Buildings Construction Rehabilitation						
SUBTOTAL, INVESTMENT						
3. GRAND TOTAL						

Source: adapted from Leighton 1993

For an ongoing safe motherhood program, managers usually estimate costs and effects for a given year. For project interventions, cost-effectiveness measures can represent total costs and total effects over the life of the project, or only costs and effects for the last year of the project when it has become fully operational and most effective. When mortality indicators are used for the effectiveness measure, however, annual estimates are best made only for large population areas or the country as a whole.

A variety of technical issues exist with respect to calculations of program costs in general, as well as for purposes of cost-effectiveness analysis (e.g., average vs. marginal costs; shadow pricing; sensitivity analysis; discounting; prorating of joint costs). Technical notes to Exhibit 3-1., in Appendix A., highlight the most important of these and provide bibliographic references for step-by-step guides. A variety of issues also exist with respect to choice of effectiveness measures for safe motherhood services (Maine 1990, Walsh 1993, Tinker and Koblinsky 1993, Leighton 1993) The MOH and MotherCare are considering in the course of their ongoing planning process which effectiveness measures will be most applicable to current program and intervention objectives.

Budget planning and monitoring. Exhibit 3-1. can also serve as a tool for a variety of planning, monitoring and analytic purposes. For example, the costs can be calculated during the planning stages to determine what budget is needed for the project interventions. Once the project is underway managers can compare projected costs to actual costs. Large discrepancies can be investigated to find out whether initial cost estimates were erroneous, or if there is wastage or inefficiencies. This type of monitoring will help managers in the development of future budgets, as well as in resource management to improve efficiency and effectiveness.

Resource management. Exhibit 3-1. is designed to track safe motherhood program costs by level of health system: community (including consumers), health center, hospital, and administrative levels. Analyzing and monitoring costs for each level can help identify the most important cost components across and within each level. Knowing the most important costs can help concentrate resource management efforts on those components of the program for maximum impact.

Resource allocation. The Exhibit can also easily be adapted to monitor these costs by urban and rural areas, or individual districts, catchment areas, or services (e.g., by preparing the Exhibit separately for each geographic area or for delivery or prenatal care). When costs are estimated for various geographic areas, they can be matched against epidemiologic, health status, or utilization data for safe motherhood services for the same areas. Analyzing this cost and health data together can help make decisions about resource allocation in relation to need. Such analyses can also help identify the equity of spending patterns and availability of safe motherhood services in relation to need.

Financial sustainability. Exhibit 3-1. provides estimates separately for recurrent and investment costs. Planning and monitoring a program's annual operating (recurrent) and annualized investment costs are important generally because of the use of these cost categories in the budget process. These two broad groups of costs are also especially important in assessing financial sustainability of an ongoing program or a new initiative — the ability of relevant funding sources to maintain the funding necessary to keep the services operating and to make the investments necessary to maintain a given level of quality of care. Having cost information for each level of the health system also helps conduct a variety of analyses related to financing needs, capacities, and options at each of the relevant local levels.

Identifying costs to consumers helps assess their affordability and, along with other information from household surveys, helps assess the impact of fees on women's use of the health services.

3.3 Methodological Issues and Recommendations

There are two main issues the MOH will face in the initial design for the cost component of the cost-effectiveness analysis.

- ▲ whether to go beyond standard studies that consider costs to the government health system only and include costs to communities and pregnant women
- ▲ whether to estimate the investment and recurrent (annual operating) costs of the interventions only or also to estimate and include the base existing costs of operating maternal and neonatal health services.

With respect to the first issue, this study recommends including costs to communities and pregnant women because of 1) the emphasis on improved health service delivery at the community level; 2) the importance of consumer willingness and ability to pay the costs of *bidan di desa* services for the long run financial sustainability of this option; and 3) the alternative strategies for improving maternal care in the project districts differ primarily in the community-level interventions, so that it is primarily only at this level that the contribution to effectiveness and the related costs will be different.

With respect to the second issue, this study recommends that data collection and monitoring concentrate on identifying and tracking only the investment and recurrent costs directly related to the interventions undertaken to strengthen maternal and neonatal health services (e.g., collect costs for Exhibit 3-1. only for trainers' salaries, refresher training per diems and logistics, additional supervision trips, medical kits and equipment, increased quantities of medicines or contraceptives, new IEC materials). The project would then compare these additional costs with the additional benefits resulting from the interventions, using whatever effectiveness measures have been chosen (e.g., reduced anemia, reduced infections, increased use of appropriate health center or hospital services for complicated cases). Focus on the intervention costs and effects makes it especially important to have available baseline information on the effects (using identical measures that will be chosen for the post-intervention period) of the current system before interventions occur.

The main reasons for limiting the focus to the interventions are that 1) in the immediate future the main policy issue relates to identifying the most cost-effective alternative for strengthening maternal and neonatal services in South Kalimantan, rather than to the costs and effects of the overall program; and 2) identifying and tracking costs for the interventions is less complex and requires fewer resources, thus reserving time and energy of MOH staff for the main project interventions. If this option is chosen and only the direct costs of the special project interventions are used, two main cost estimating tasks can be omitted at the health facility level: 1) base personnel costs for delivering maternal and neonatal services at the health facility level, and 2) base indirect costs for health facilities (e.g., building maintenance, rent, utilities, facility administration). These can be omitted assuming that there is sufficient slack in the current system that new staff will not need to be hired to handle the increased utilization expected to occur. Similarly, calculation of indirect costs, pro-rated for the share used by safe motherhood services, can also be omitted under this option, unless there is reason to believe that total indirect costs for health centers or hospitals will rise due to the intervention activities.

At the community level, identifying the costs directly related to the improvement strategies may be more difficult to separate out from ongoing program costs, depending on various capacities already existing in each community and which intervention strategies are finally chosen. This problem is most prominent depending on whether or not a village midwife (*bidan di desa*) is already practicing in a village. The next section of this paper discusses options for comparing different intervention models.

Once the administrative and information systems have been strengthened, more detailed analyses of the base costs to keep the whole system operating can be conducted and systems established for routine tracking. This more complete information is likely to be important in the longer run for the MOH to be able to justify its budget spending for maternal and neonatal health services with data that confirms the total effect of the total expenditures. It will also be important in the longer run to compare the total costs of the strategies to strengthen maternal and neonatal health care with the total base costs of the existing system for purposes of addressing financial sustainability of the improved system.

4.0 RESEARCH DESIGN FOR ASSESSING THE COST-EFFECTIVENESS OF ALTERNATIVE MODELS

4.1 Alternative Community Models

Most of the plans for strengthening maternal and neonatal health services in the South Kalimantan project districts include similar interventions (e.g. training, IEC, improvements in administration, upgrading of medical equipment and facilities) for all formal MOH levels of health facilities (health centers and subcenters and hospitals) and personnel. Variation exists primarily at the village level: although virtually all villages have TBAs and village health posts, not all yet have village midwives (*bidan di desa*). Similarly, efforts under the National Safe Motherhood Strategy have involved similar strengthening efforts at the health center and hospital levels, but involve alternative interventions at the village level.

In this context, the MOH faces several options in designing the overall methodology for assessing the cost-effectiveness of safe motherhood interventions in the South Kalimantan project areas:

- ▲ assess the total costs and total effects of all the interventions conducted in the project districts
- ▲ assess the relative cost-effectiveness of two alternative village level strategies in the project districts, in the context of also strengthening the health center and hospital referral levels
- ▲ assess the relative cost-effectiveness of three alternative village level strategies, the two that exist in the South Kalimantan project districts and one additional model in operation elsewhere in the country.

This study recommends taking advantage of the existence of three models to make a comprehensive comparison of the cost-effectiveness of the most prevalent alternative strategies. Such a comprehensive comparison would make the greatest contribution to the longer run objectives of strengthening safe motherhood services in Indonesia with the most effective use of resources.

Exhibit 4-1 summarizes the three possible village level models, all supported by improved services at the health centers and hospitals. At the village level:

- ▲ **Model 1** includes the implementation of a community-oriented IEC program and the placement of a community midwife (*bidan di desa*) trained in basic essential obstetrical care (BEOC). The *bidan di desa* is an extension of the formal health system at the village level, who maintains formal links with the supporting levels of the health system through training, supervision, the provision of supplies, the referral of complicated cases to higher levels, and participation in the health information system. The refresher training, medicines, and other recurrent costs (at least in the medium term) that are involved in establishing a *bidan di desa* in the village are covered mainly by the public health system.

- ▲ **Model 2** builds upon the use of existing traditional birth attendants (TBAs) who are currently the main source of maternal care in general, and delivery care in particular, for the majority of women in rural South Kalimantan. In this model, their services will be improved through the provision of kits, and through training in life saving skills during their visits to health centers.
- ▲ **Model 3** builds upon the existing village health posts (*posyandu*), which have been instrumental in the successful implementation of community-based family planning services in Indonesia. This model involves training community volunteers in communication with and counseling pregnant women, in the detection of risk factors through an antenatal risk scoring system, and in selecting the appropriate level of care for pregnant women.

Exhibit 4-1. Alternative Models to Strengthen maternal and Neonatal Health Services in South Kalimantan, Indonesia

Health System Level	MODEL 1: South Kalimantan Districts	MODEL 2: South Kalimantan Districts	MODEL 3: Districts Elsewhere in Indonesia
Administration	Administration Strengthen information systems, referral, managerial and leadership capacity	Administration Strengthen information systems, referral, managerial and leadership capacity	Administration Strengthen information systems, referral, managerial and leadership capacity
Referral Facilities	<i>District Hospitals</i> <i>Health Centers with Beds</i> Upgrade Facility Infrastructure Physician Training Midwifery Training Medical Equipment and Supplies	<i>District Hospitals</i> <i>Health Centers with Beds</i> Upgrade Facility Infrastructure Physician Training Midwifery Training Medical Equipment and Supplies	<i>District Hospitals</i> <i>Health Centers with Beds</i> Upgrade Facility Infrastructure Physician Training Midwifery Training Medical Equipment and Supplies
Intermediate Facilities	<i>Health Centers & Subcenters</i> Midwifery Training Medical Equipment and Supplies	<i>Health Centers & Subcenters</i> Midwifery Training Medical Equipment and Supplies	<i>Health Centers & Subcenters</i> Midwifery Training Medical Equipment and Supplies
Community-Based Services	<i>Community-based IEC</i> <i>Bidan di desa</i> Training in basic essential obstetrical care Supplied with medical equipment and supplies	<i>Traditional Birth Attendants</i> Supplied with medical kits Life Saving Skills training during supervisory visits to health center	<i>Community-based detection of Risk Factors</i> <i>Health Posts (Posyandu)</i> Village health post worker trained in risk scoring, IEC, and referral

At the **first referral facility** and **intermediate provider** levels, the three models share the same technical interventions. However, the level of utilization of services at these levels, especially for the management of complications, will depend on the effectiveness of community-based interventions to refer pregnant women to higher levels of the district health system.

The operation of the two first models — using *bidan di desa* and TBAs to provide community-based Safe Motherhood services — would coexist within the project districts until such time as *bidan di desa* can be established in all villages. This situation presents an opportunity for analyzing the cost-effectiveness of the *bidan di desa* program compared with the status quo if a sampling methodology is used which takes into account the gradual extension of midwives to all the villages. Section 4.3 of this technical note illustrates such a sampling methodology.

The third model — using village health posts to provide Safe Motherhood services — is currently being tested in other districts of the country, including the Probolinggo district in East Java (Poedji et al., 1995). Thus, in addition to the cost-effectiveness comparison that would be possible from implementing Models 1 and 2 in South Kalimantan, the implementation of Model 3 in other parts of Indonesia allows for a comparison with another principal Indonesian model.

4.2 Data Collection Instruments and Sources

4.2.1 Costs for Pregnant Women

The most reliable instruments for estimating costs borne by pregnant women and their families are household survey interviews. Since the MOH and MotherCare are planning to conduct pre- and post- surveys in South Kalimantan, a module could be included for recording expenditures (time and money costs) for the management of pregnancy during a specified recall period, say one year. This module would have three sections: one section for determining resource use during pregnancy for antenatal care, one section for delivery care, and one section for postpartum care. Each one of these sections would specify very clearly the type of maternal health provider (e.g., TBA, *bidan di desa*, health center nurse) used by the pregnant women.

The table in Appendix A. provides sample questions for determining antenatal care time and monetary expenses. The table assumes that the first antenatal care provider has already been identified in a question preceding the table. Since a pregnant woman may have visited multiple care providers during pregnancy, the table should be followed by a question asking if such events occurred and identifying the other care providers which were visited by the pregnant woman. Additional, identical tables would cover all other care providers who were visited by the pregnant woman and would record only monetary expenses made at each of these other providers.

In addition, a section on sources and expenditures for delivery care could gather information to identify 1) the health care provider during delivery; 2) family resources (time, monetary payments, and payments in kind) used for various items in the course of delivery (e.g., travel, lodging and food, fees for delivery, fees for hospitalization, etc.)

Information on distance, travel time and labor market characteristics should be collected also at the cluster or community level to complete the information collected in the pregnant woman module. This community information will be needed to improve estimates of the value of time costs and to make realistic assumptions in a sensitivity analysis.

4.2.2 Health Facility Costs

Facility costs can be collected from project budgets for the intervention and from a sample of health centers and hospitals, using available budget and financial records to fill in background data that can be summarized and entered on a summary table, such as Exhibit 3-1. This task will be more or less difficult depending on the level of health facility (e.g., health center vs. hospital), level of detail of existing financial records, and on whether or not managers decide to include base operating costs, along with the intervention costs, as Section 3 of this paper discusses. Relevant recurrent costs will come primarily from facility records and the purchase price and life of equipment, vehicles, and other capital items will come primarily from project intervention budgets.

4.3 Sampling Methodology

The gradual extension of *bidan di desa* to villages in South Kalimantan offers the opportunity of a natural experiment through which the cost-effectiveness of the *bidan di desa* program could be evaluated relative to other alternatives sharing the same referral system at higher levels of the health system. Given the gradual process of this extension, there will be four subsets of villages in any catchment area during the project time frame:

- ▲ villages where health centers or subcenters are located;
- ▲ villages where *bidan di desa* are currently (before project interventions) operating and where safe motherhood community-based interventions will be implemented (**model 1**);
- ▲ villages where *bidan di desa* will start operating during the project time frame and where safe motherhood community-based interventions will be introduced (**model 2, model 1**); and
- ▲ villages where *bidan di desa* will not be operating, but where traditional birth attendants are functioning, during the project time frame (**model 2**).

This structure of the catchment areas of health facilities could be used to define a sampling methodology not only for the household presurvey and postsurvey, but also for the facility survey.

Sampling frame. It is assumed that a list of villages and towns, including subdivisions such as clusters defined from a census map, is available. The list can be stratified by two categorical variables: (1) a district variable (with three possibilities: Banjar, HSS, and Barito Kuala), and (2) a model variable (with three possibilities: villages with a TBA but no health center or *bidan di desa*, villages with a *bidan di desa* but no health center, and villages or towns where health centers and district hospitals are located. The project area could thus be divided in nine strata using the above variables (three districts with three models in each district).

Selection. Selection of the presurvey/postsurvey household sample and the facility sample for the cost analysis could be integrated so that household samples are drawn from the catchment areas of the facility samples. The details of the selection procedures would depend on the information available for the construction of the sampling frame.

Exhibit 4-2 provides an illustration of a desirable configuration of household and facility samples. The Exhibit assumes that a sample of 2,600 pregnant women could be statistically sufficient to detect changes in maternal and perinatal health care utilization resulting from the implementation of safe motherhood interventions over a time period to be determined (say two years).

The illustrative samples attempt to address three methodological issues.

- ▲ First, sufficient subsamples of pregnant women will be necessary to compare maternal health care behavior relative to the availability of specific components of safe motherhood interventions across districts and through a relatively short period of time. This requires the oversampling of villages where *bidan di desa* and health facilities are located.
- ▲ Second, the possibility of merging household survey information from pregnant women and facility information would greatly enrich the evaluation analyses in terms of offering the possibility of comparing the influence of maternal health service quality and price (from the facility data) on changes in use of maternal health services (from the household survey).
- ▲ Third, the illustrative sample attempts to maintain a balance not only between the household sample and the population sizes of the three districts, but also between the *bidan di desa* and health center sample and the availability of these providers in the three districts.

Exhibit 4-2. An Illustrative Sample Configuration to Assess Alternative Models for Strengthening Safe Motherhood Services in South Kalimantan, Indonesia								
District	Presurvey/Postsurvey Sample Clusters ¹				Facility Sample			
	Village without health center or Bidan di desa	Village with <i>Bidan di desa</i> only	Village or town with health center or district hospital	All	<i>Bidan di Desa</i>	Health center without Bed	Referral Center: one district hospital plus two health centers with beds	All
Banjar	16	16	16	48	16	14	3	33
HSS	7	7	7	21	7	5	3	15
Barito Kuala	7	7	7	21	7	5	3	15
All	30	30	30	90	30	24	9	66

Note: 1. Clusters of 1000 individuals are assumed. Assuming a ratio of 29 pregnant women per year for a population of 1000, the 90 clusters could yield a sample of 2,610 pregnant women and 2,620 live births.

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APPENDIX A.

Technical Notes to Exhibit 3-1.

1. For most practical program planning and evaluation purposes, these recurrent and investment costs will be valued at current market prices, that is, at whatever the price is in the country to purchase fuel, supplies, medicines or to pay salaries and benefits . Some analyses also require consideration of economic costs, as distinct from these accounting or budgeting costs, to take account of shadow prices and opportunity costs. These other analyses are usually done on a special, rather than routine, basis. Measures of the value of time spent travelling to or waiting for health services, representing the opportunity cost of these activities, may be needed in estimating consumer costs for safe motherhood services. The simplest measures are average market wage rates or informal sector earnings, available from employment and economic statistics sources usually produced at the national level.

2. The most time consuming estimates needed for this table will be separating out the time/salary and related costs of integrated services that are directly applicable to safe motherhood and allocating the joint, or indirect, costs that support safe motherhood and other health services. At the hospital level, where services may be clearly allocated to separate wards (e.g. maternity ward) or antenatal clinics, and if financial records make this distinction, some of this process may be less time consuming.

For example, it will be necessary to estimate the costs of fuel used when a multipurpose vehicle transports an emergency obstetrical case to a higher level facility or to pro-rate the salary and benefit costs of health and administrative personnel working on the safe motherhood program who also spend time working on other health services.

Indirect costs that will need to be pro-rated include rent, utilities, and building maintenance. One method for pro-rating these costs is on the basis of floor space if the safe motherhood has a defined space in the health center or on the basis of the proportion of staff time spent on safe motherhood activities, or percentage of visits.

3. Useful references and step-by-step guides for these and other technical issues in cost-estimating include: Over (1992), Creese and Parker (1990), Reynolds & Gaspari (1985), and MAP 1994.

APPENDIX B.

Sample Questions for Determining Time and Monetary Expenses for Antenatal/Postnatal Care¹

Line	First Antenatal Care Provider Expenses								
	How did you get to the care provider for your antenatal visit?	How much time did it take to get from home to the care provider during yourantenatal visit?	How much did you pay for travel from home to the care provider including your travel expenses to get back home during your antenatal visit ?	How much time did you have to wait between the time you arrived at the care provider and the time you were provided care during your.... antenatal visit?	How much did you pay for consultation during yourantenatal visit?	How much did you pay for drugs during your.... antenatal visit?	How much did you pay for exams during your.... antenatal visit?	How much did you pay for other services during your.... antenatal visit?	Have you been referred to another care provider during yourantenatal visit?
	X	X+1	X+2	X+3	X+4	X+5	X+6	X+7	X+8
1									
2									
3									
4									
5									
6									
7									
8									
	X= 01 foot 02 boat 03 taxi 04 bus 88 No. n th visit								IF YES, FILL IN REFERRAL SECTION "Y"

1. For postnatal care, just replace "antenatal" by "postnatal"